

WHAT IS CLAIMED IS:

1. A hierarchical storage device, comprising:
 - a library storage device configured to store realtime
5 stream data in units of segments subdividing each realtime stream data;
 - a cache storage device configured to store selected segments among the segments stored in the library storage device;
 - 10 a memory unit configured to store random access point segment information from which a possibility for each segment to contain a point that can potentially be random accessed in future can be estimated; and
 - a control unit configured to control a selection of
15 the selected segments to be stored in the cache storage device according to the random access point segment information stored in the memory unit.
2. The hierarchical storage device of claim 1, wherein
20 the control unit includes a discarding segment selection unit configured to select segments that are candidates for discarding from the cache storage device, among the selected segments stored in the cache storage device, according to the random access point segment information
25 stored in the memory unit.
3. The hierarchical storage device of claim 1, wherein the control unit includes a storing segment selection unit configured to control whether or not a certain segment that
30 is not stored in the cache storage device should be stored into the cache storage device, according to the random access point segment information stored in the memory unit for said certain segment.
- 35 4. The hierarchical storage device of claim 3, wherein

the storing segment selection unit controls whether or not to store said certain segment into the cache storage device upon receiving a request to open data stored in the library storage device or the cache storage device, according to
5 the random access point segment information for said certain segment which belongs to said data.

5. The hierarchical storage device of claim 1, wherein the control unit includes an update unit configured to
10 update the random access point segment information for a segment containing a certain point on the realtime stream data upon receiving a seek request with respect to said certain point.

15 6. The hierarchical storage device of claim 1, wherein the control unit includes an update unit configured to update the random access point segment information for a segment containing a certain point on the realtime stream data according to a seek step from a position at which a
20 seek pointer is located when a seek request with respect to said certain point is received to said certain point specified by the seek request.

7. The hierarchical storage device of claim 1, wherein
25 the control unit includes an update unit configured to update the random access point segment information for a segment containing a start point of sequential accesses to the realtime stream data according to an amount of data that are sequentially accessed consecutively from a certain
30 point on the realtime stream data.

8. The hierarchical storage device of claim 1, wherein the control unit includes an update unit configured to
35 update the random access point segment information for a segment containing a certain point on the realtime stream

data upon receiving a request for registering said certain point as a random access point.

9. The hierarchical storage device of claim 1, wherein
5 the memory unit stores entries for candidate segments which should be judged as having a possibility of containing a point that can potentially be random accessed in future, and

the control unit includes an update unit configured to
10 update the random access point segment information by adding/deleting an entry for each candidate segment into/from the memory unit.

10. The hierarchical storage device of claim 9, wherein
15 the control unit realizes a referring to the random access point segment information of a referring target segment by judging whether the referring target segment contains a point that can potentially be random accessed in future or not according to whether or not an entry for the referring
20 target segment is stored in the memory unit.

11. The hierarchical storage device of claim 1, wherein the memory unit contains a counter for each candidate segment indicating a likelihood of each candidate segment
25 being judged as having a possibility of containing a point that can potentially be random accessed in future, and the control unit includes an update unit configured to update the random access point segment information by updating a value indicated by the counter for each
30 candidate segment in the memory unit.

12. The hierarchical storage device of claim 11, wherein the control unit realizes a referring to the random access point segment information of a referring target segment by
35 judging whether the referring target segment contains a

point that can potentially be random accessed in future or not according to whether or not a value of the counter for the referring target segment is not less than a prescribed threshold.

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13. The hierarchical storage device of claim 11, wherein the control unit has a plurality of conditions regarding update of the random access point segment information, and determines an increment of the counter to be used by the
10 update unit at a time of updating the random access point segment information according to one of the plurality of conditions that is applied in updating the random access point segment information of each candidate segment.

15 14. The hierarchical storage device of claim 1, wherein the control unit realizes a referring to the random access point segment information of a referring target segment by directly referring to the random access point segment information of the referring target segment stored in the
20 memory unit.

15. The hierarchical storage device of claim 1, wherein the random access point segment information is stored into the memory unit, either when a start point of sequential accesses to the realtime stream data satisfies a prescribed
25 condition by which the start point can be estimated as a desired random access point of a user or when a request for registering a point on the realtime stream data as a random access point is received, or both.

30 16. A method for controlling a hierarchical storage device formed by a library storage device storing realtime stream data in units of segments subdividing each realtime stream data and a cache storage device storing selected segments among the segments stored in the library storage device,
35 the method comprising the steps of:

storing random access point segment information from which a possibility for each segment to contain a point that can potentially be random accessed in future can be estimated; and

5 controlling a selection of the selected segments to be stored in the cache storage device according to the random access point segment information stored by the storing step.

10 17. A data playback device, comprising:

an output unit configured to playback and output either one or both of input audio data and input video data;

15 a command unit configured to command playback, stop, or shifting of a playback position forwards/backwards, to the output unit according to a user input;

20 a memory unit configured to store a plurality of playback start indexes; and

25 a control unit configured to record information regarding a playback position that is determined according to the user input as a playback start index in the memory unit when the user input received by the command unit is in a prescribed pattern, and to present the plurality of playback start indexes recorded in the memory unit to a user so as to urge the user to select a desired playback position.

18. The data playback device of claim 17, wherein the control unit records information indicating a position from which playback is started as the playback start index, when the user input indicates a continuous playback over a prescribed period of time.

19. A method for controlling playback and output of either one or both of input audio data and input video data

according to a user input indicating playback, stop, or shifting of a playback position forwards/backwards, the method comprising the steps of:

5 recording a plurality of playback start indexes, each playback start index being information regarding a playback position that is determined according to the user input which is recorded when the user input is in a prescribed pattern;

10 presenting the plurality of playback start indexes recorded by the recording step to a user so as to urge the user to select a desired playback position; and

starting playback from the desired playback start position selected by the user using the plurality of playback start indexes presented by the presenting step.

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20. A server client system, comprising:

20 a hierarchical memory server having a library storage device storing realtime stream data in units of segments subdividing each realtime stream data and a cache storage device storing selected segments among the segments stored in the library storage device; and

25 a data playback client for playbacks and outputting a desired segment of a desired realtime stream data obtained from the hierarchical memory server according to a user input indicating playback, stop, or shifting of a playback position forwards/backwards;

wherein the hierarchical memory server includes:

30 a server side memory unit configured to store random access point segment information from which a possibility for each segment to contain a point that can potentially be random accessed in future can be estimated;

35 a control unit configured to control a selection of the selected segments to be stored in the cache storage device according to the random access point segment information stored in the server side memory unit; and

a segment transfer management unit configured to read out the desired segment of the desired realtime stream data requested from the data playback client, either from the cache storage device when the desired segment is stored
5 in the cache storage device, or from the library storage device when the desired segment is not stored in the cache storage device, and to transfer the desired segment to the data playback client; and

the data playback client includes:

10 a client side memory unit configured to store a plurality of playback start indexes, each playback start index being information regarding a playback position that is determined according to the user input which is recorded when the user input is in a prescribed pattern; and

15 a control unit configured to present the plurality of playback start indexes recorded in the client side memory unit to a user so as to urge the user to select a desired playback position, and to request a segment containing the desired playback position selected by the
20 user as the desired segment to the hierarchical memory server.

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